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Leveraging Interpretable Machine Learning for Enhanced Freshwater Resource Management in the Canary Islands: A Data-Driven Study

Horacio Pérez-Sánchez[1], Francisco José Segura-Mendez[2], Patricia Jimeno-Saez[2], Javier Senent-Aparicio[2]

[1]Structural Bioinformatics and High-Performance Computing Research Group (BIO-HPC), Computer Engineering Department, Universidad Católica de Murcia (UCAM), Murcia, Spain.

[2]Department of Civil Engineering, Universidad Católica San Antonio de Murcia (UCAM), Murcia, Spain

Abstract

The advancements in artificial intelligence models have demonstrated notable progress in the field of hydrological forecasting. However, predictions of extreme climate events are still a challenging task. This work presents the development and testing procedures of several interpretable machine learning techniques for short-term meteorological drought forecasting. These techniques were implemented to forecast multi-temporal drought indices, three-month and six-month standardized precipitation evapotranspiration (SPEI-3 and SPEI-6), at the seven islands that form the Canary Islands. To evaluate the model's performance, we utilized statistical accuracy measures, conducted graphical inspections, and compared it with benchmark models. We achieved a good trade-off between predictive accuracy and interpretability of the obtained model. The machine learning techniques applied represent a promising and reliable modeling approach for SPEI prediction and increased our knowledge of drought weather patterns in the Canary Islands, which is very useful for efficient water resource management and can be implemented on other islands around the world.

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